Alvin Dive 4204 -June 28, 2006

Objective is to investigate the EPR axis near 9° 53'N for possible hydrothermal vent activity seen on New Horizon TowCam#3 survey and to characterize and sample the new lava flows at the axis and on the off-axis (to the east) fissure ridge seeing in both the NH06 TC#3 survey at 9° 54.5'N and on the AT15-6 TowCam #3 survey at 9° 53'N.

Dan Fornari - Port Observer, Ken Rubin - Stbd. Observer, Mark Spear - Pilot

Time (GMT)	**Observations**
1426	In ball at 400 m depth, descending
1436	716m depth, EChem has been on since ~ 200 m depth, no xponder navigation for this dive, Atlantis top lab will survey us in when we land on bottom and then we will key in the x/y into the DVLnav system.
1446	at 1000 m, getting ready to do spins for magnetometer calibration
1448	1072m turning to stbd for Maggie spin
1455	finished 1sts spin to stbd, the depth is 1300 m, but the depth on the DVNnav screen is not getting the correct depth, mark is resetting DVLnav
1501	finished 2nd Maggie spin, depth 1490 m, target depth is 2530 m to axis
1523	at 2101 depth, put underlay on the DVNnav screen, may be a bit south of intended target, Echem is on and Maggie is on.
1538	2525 m depth ~10 m above bottom, making bottom approach
1540	2540 m depth, 14 m altitude
1542	2554 m depth, 9 m altitude, seeing sed. Covered lobates making bottom approach
1542	2560 m depth, landing on sed. Covered lobates west of EPR axis at 9 53'N
1546	sitting on bottom, turned off lights, waiting for surveyed position from Atlantis top lab
1552	Took a few photos with handheld.
1554	maggie turned off momentarily to check for ground, now back on
1558	top lab surveyed position for Alvin on bottom X=3343 Y=82855
1608	2564 m depth, position keyed into DVLnav and will now head east towards axis to look for new lava contact, downlooking camera is grounded and observer strobes have small ground too
1611	underway o/c 090
1613	2562 m did not go more than 50 m and we have new lava contact. Sitting on bottom taking sample #1
1616	at contact with new flow west of the axis, panning around with port camera to give view of outcrop, mark preparing to sample
1620	**Sample #1 X= 3416 Y=82861 , 2563 m, in situ sample broken off new flow where it contacts sedimented lobates**
1630	2559m, recording 3-chip on port recorder, going east, flow more hackly 3 m altitude, saw nice lava whorl
1633	new flow going over old, large bolster shaped pillows, underlying surface has ~ 2 m relief over large bolsters. New flow has abundant decorations, buds.

Time (GMT)	Observations
1635	2555 m depth, now mostly in new flow w/decorations, only very few older pillows sticking through
1636	2551m depth, alt 2 m, seeing some areas where there is clear sheet flow coming from the north, now looks like we are going over a channel with sheet flow, unclear if new or old, but think it is new lava.
1637	seeing other side of channel, o/c 091, flow coming from the axis, channel probably a few 10s of meters high
1638	I have the north margin of the channel, definitely new lava, ken seeing into the channel on port side.
1639	2548 m depth, moving a bit south into main body of channel, continuing upslope to axis, all curtain folded sheet flow on margin, with more lineated sheet flow within the channel.
1640	seeing crabs, mark sees some cloudiness in the water, looks like we're going over the margin of the channel.
1642	2545 m going over new flow but with occasional outcrops of older lava
1645	2537m, 3 m altitude, occasional crabs, mostly new lava, likely only 1 m thick, seeing into older surface on occasion. New flow mostly lobates and sheets/folded sheets in channel area
1647	going over collapse, perhaps some diffuse flow, looks like axis, new lava flow in the collapse, 2533 m depth
1649	crossed the axis, using Imagenex, about 10 m wide (sub length)
1650	turning north to go back across the collapse trough, ken sees new lava on the walls, abundant crabs on the walls
1651	seeing some bacterial mat on walls of collapse, no shimmering water, decided to keep looking to the north, many baby brachyurid crabs, on west side of axis, looking for place to sample new flow at trough rim, in collapse area
1702	**Sample #2 X=3939 Y=82969, 2534 m depth at west rim of trough from new lava flow, piece of lava pillar? Or next to one?**
1707	turned to 310 to try to intersect narrow trough, made several crossings trying to get back to it to follow it north
1710	seeing nested collapse along trace of axis w/orange hyx staining in walls of collapse, seems like a trace over an eruptive fissure, seeing enechelon collapse pits along 350 trend.
1718	headed off to 030, now coming back to 310 course to find trace of axis
1722	passed over a primary fissure, very deep, with collapse along it, seeing also old pillows/lobates with sediment cover, fissures cutting through it, new lava did not spill out very far or much from fissure here.
1723	fissure with new lava in it under my viewport, we are following it, ken sees older pillows out stbd side. Trying to figure out if we are E or W of the axis,
1724	2531 m, now seeing older lava, turning west to 260 to angle off to see if we pick up young lavas and clearer indication of the axial zone
1725	in older pillows/lobates now w/sediment cover, heading 260

Time (GMT)	Observations
1729	still in older pillows/lobates, ken sees fissure with new lava in bottom, turning to go 350, seeing several fissures right here, definitely has new lava in the floor of the fissure, about 2-3 m wide, with new lava in it. Fissure cuts
1732-33	excellent photos of following the fissure with the new lava in the bottom of the fissure, some spilled out of the crack. Fissure cuts through older pillowed terrain
1734	now all new lava, lobates under sub
1735	just passed contact of new flow with older sed. Covered sheet flow, still lots of baby brachy. Crabs even on older flow, turning to 260
1742	in older lobates and pillows with sed. cover, called up to ask tim to get post of southern vent area from NH06 surveys
1746	tape 1 ends
1752	tape 2 starts,
1754	2532 m depth, heading south (158), got target to the south about 700 m, near where we first intersected the axis, from toplab, passing over older pillows/lobates now, there were 3 targets, from vents seen on NH06 TowCam#3 survey.
1756	passing over deep fissure, following fissure to the south, I'm seeing new lava flow on east side of fissure as we are flying south, seeing patches of new flow and older sed. covered pillows.
1758	some new lava, at first target but no seeing any significant or any hyx venting or diffuse flow. New lava is present with some staining and occasional whitish patches, but not very continuous or thick.
1800	2534 m depth, heading for 2nd target, seeing lots of baby brachy. Crabs. Some orange hyx staining in interstices of lobate forms. All new flow here.
1803	passing over 3-4 m wide fissure with cloudy water and crabs abundant, but no extensive area of microbial staining, but does look like there is a little activity. Following it to the south, new flow in bottom of fissure, shelly lobates
1804	crack/fissure narrows now, roofed over, not seeing the crack anymore
1805	2531 m depth, lots of crabs on older pillows, crossing over fissure now
1806	flying down west margin, new flow is flowing down the wall of the fissure
1806:57	great shot of new lava draping down into the fissure
1811	seeing new flow here, but with older lobates too
1816	2536 m depth, headed south, have about 350 m to go to get to the southern vent location on the NH06 TC#3 survey and where we first approached the axis on this dive. We are cutting across fissure with new lava in it and spilling out slightly, new lava lobate morphology, thin flow, <1 m thick in most places
1820	250 m to go to get to the target, seeing mostly new lava flow, lobate morphology, seeing it flow into older collapse pits. Some hyx staining but no focused flow. Still have many small brachy. Crabs.

1825 2535 m depth, near vent target, going over new lobate lava flow as thin veneer over older sed. covered lobates and pillows

1840 2539 m depth, zigging back and forth over area of vent target, seeing new flow but no sign of hyx activity. Fissure is very discontinuous and new flow at times issues from it, at other times is within it, and then other times you see it cascading into the fissure.

1852 going to head east from here to get to old pillow ridge, then suspected new fissure ridge before intersecting scarp.

1853 heading east now, 2540 m depth, crossing new flow mostly lobates with occasional pillows, some decorations on the forms. Axis is dominated by fissures mostly with new flow in it and sometimes spilling out. Fissure is cracking older lobate and pillow terrain. No focused venting observed, but there is a high concentration of small brachyr. Crabs.

1855 continuing over new flow, lobate morphology with older pillows sticking through it.

1856 2548 m, about 100 m east of axis, about 14 m deeper than crestal depth, seeing now curtain folded sheet flow as we proceed to the east.

1900 at margin of new lava flow where lobate/curtain folded sheets abut the pillows at the base of the off axis pillow ridge. Will set up to take samples of the new flow at the east margin of it.

1903 2550 m depth, maneuvering to take samples of old and new lava X=4235 Y=83000

1904 good video of contact and location of samples #3 and #4, going to sample older pillowed flow - from pillow ridge- first then the new lava coming from the axis.

1909 Sample #3, X=4235 Y=83001, 2550 m depth, from older lobate flow at contact with new lava ~ 100 m east of axis.

1916 Sample #4A/B, X=4234 Y=82998, 2550 meters, new lava at contact with older sediment covered lobates ~100 m east of the EPR axis

1921 good videdo of sample #4 site, heading east to get to new fissure ridge lava flow.

1925 2548 m depth, heading east from contact between new axial flow and older pillow ridge flows.

1927 going over sed covered lobate and pillows on pillow ridge, ascending west facing slope

1929 at crest of the older pillow ridge, 2540m depth is summit of it and a small fissure at summit

1930 at new flow on EAST side of older pillow ridge, this is the new flow coming from the off axis fissure ridge. Setting up to sample

1931 X=4421 Y=83058, 2546 m depth, at west margin of new fissure ridge, location is about 400 m east of the axis.

1935 **Sample #5 of west margin of new fissure ridge flow, 2546 m depth, X=4422, Y= 83058.**

1937 Heading east now from new fissure ridge sampled at #5 sample location.

1938 heading 080, mostly pillows and lobates with some decorations on the new flow

1939 2542 m depth, new fissure ridge flow morphology more lobate here

1941 at 2541 m depth, now new flow is curtain folded sheet flow, this is likely the axis of the fissure ridge, dropping target so we can know the trend of the fissure ridge axis. There is prominent hyx staining, flock in the lows in the lava folds.

1944 2541 m depth, at scarp where fissure ridge new flow abuts it. Scarp face is scalloped, shows some possible original collapse morphology but considerable talus chutes and exposures of lobate flow sequences. Top of scarp has older sed. covered lobates. Scarp height is ~2-3 m.

1946 good video of scarp morphology, now backing away from scarp to land at the base of it

1950 back at base of scarp on new fissure ridge flow

1951 end tape 2

1954 start tape 3

1955 2545 m depth, looking for sampling spot to collect new lava against scarp, will be sample #6

2008 Sample #6, X=4579 Y=83092, 2545 m depth - sample of new fissure ridge flow where it abuts the west facing scarp ~500 m east of axis, <u>also sampled orange sea star next to the new lava - that is sample#6 too, put in biobox</u>

2013 good video of new lava against scarp base, new flow is lobate

2016 proceeding north along scarp face w/new flow contacting it, now flow is curtain folded sheet flow in places, also some hyx/oxide staining in interstices between lava forms

2019 2541m depth, flow trend seems to be trending away from scarp, lobate lobes contacting the older lobates

2022 running north along contact between new flow and older lobates

2023 now turning 260 to head to trace of axis of new fissure ridge, we ran about 200 m along the new fissure ridge flow, parallel to the west facing scarp

2026 2545 m depth, running along 260 just crossed new fissure ridge lava /old lobate lava contact, seems like this contact may be the northern limit of this fissure ridge as ken sees older lava out the stbd side and I have new lava of port side.

2027 good video of new/old lava contact while running west along northern margin of the fissure ridge, going to turn to head 170 down axis of fissure ridge.

2030 2543 m depth, turned to 170 and heading back into new fissure ridge flow, along suspected axis of it, just crossed over contact between old sed. covered lobates and new lobate lavas

2032 seeing more hyx staining on new flow surface and now surface is curtain folded sheet flow

2036 2542 m depth, still on curtain folded flow, occasionally more flat sheets, but generally curtain folded and also seems like we are driving up the center of a channel, trending SE-NW that may be over the eruptive fissure

beneath the sheet flow that marks the axis of the new fissure ridge. Also extensive collapse within the curtain folded flow.

2040 getting set up to slurp hyx oxide fluff, 2545 m depth at summit of fissure ridge in curtain folded lavas w/abundant staining/fluff. Good video of sample site.

2045 Sample#7, macro slurp, X=4527 Y=83092, 2545 m depth, of hyx oxide fluff on summit of new fissure ridge

2100 Sample#8, X=4526 Y-83092, 2545 m depth, curtain folded sheet flow at axis of the new fissure ridge flow where hyx oxide staining was slurped in sample #7

2103 sample 8 in video

2106 good video of sample site for samples 7 and 8

2108 2542 m depth, leaving sampling site headed 170 to traverse along axis of new fissure ridge to the south, traversing sheet flows w/occasional hackly or curtain folded areas, still seeing channel levee

2113 following sheet flow in channel to south along axis of new fissure ridge, staining continues

2115 more hackly flow, or broken up curtain folded flow surfaced in new lava

2119 curtain folded new lava continues

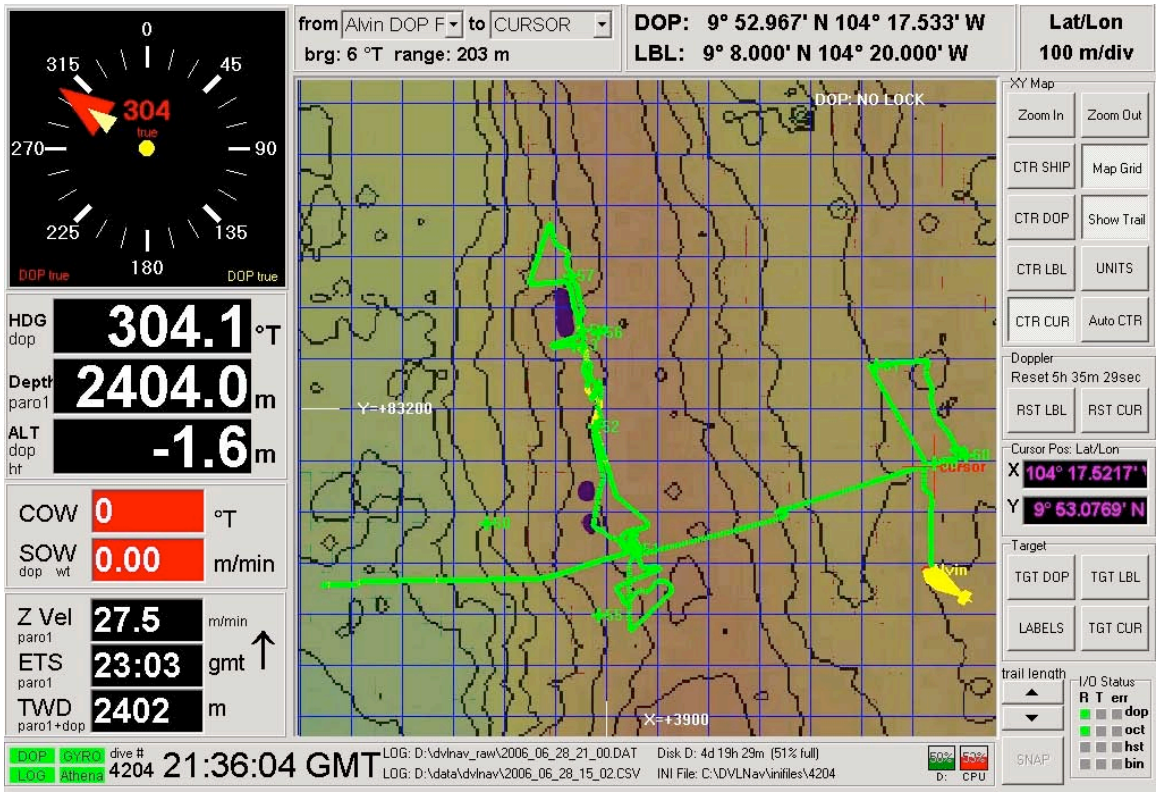
2120 stopped to collect last sample of hackly new fissure ridge flow at this spot before ending dive and also taking water sample in major pair for bottom water

2121 White major pair sampled for bottom water, 2545 m depth, X=4535 Y=82862

2127 Sample #9, X=4535 Y= 82862, 2545 m depth, new fissure ridge flow, at axis, hackly sheet flow

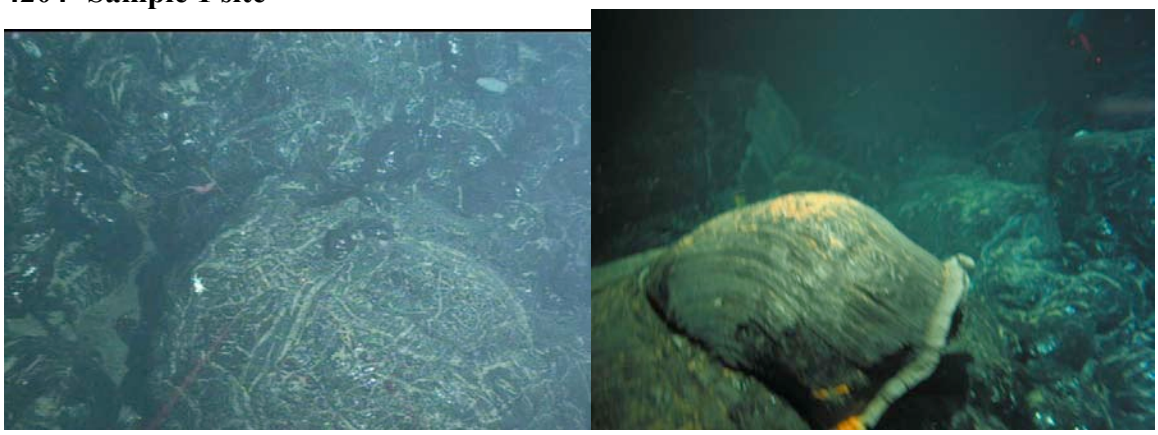
2130 weighs away, end of dive

DVLnav snapshot of 4204 dive track

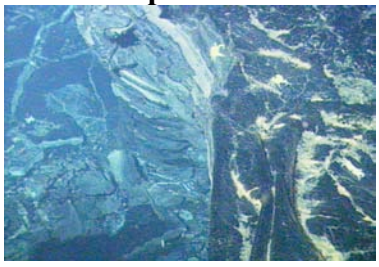


Photos of Sampling Sites- Dive 4204

4204- Sample 1 site

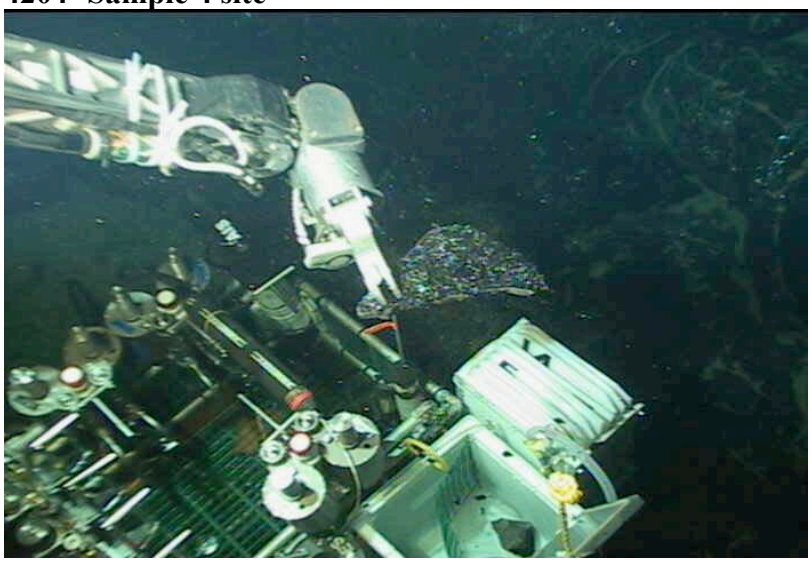


4204- Sample 2 site



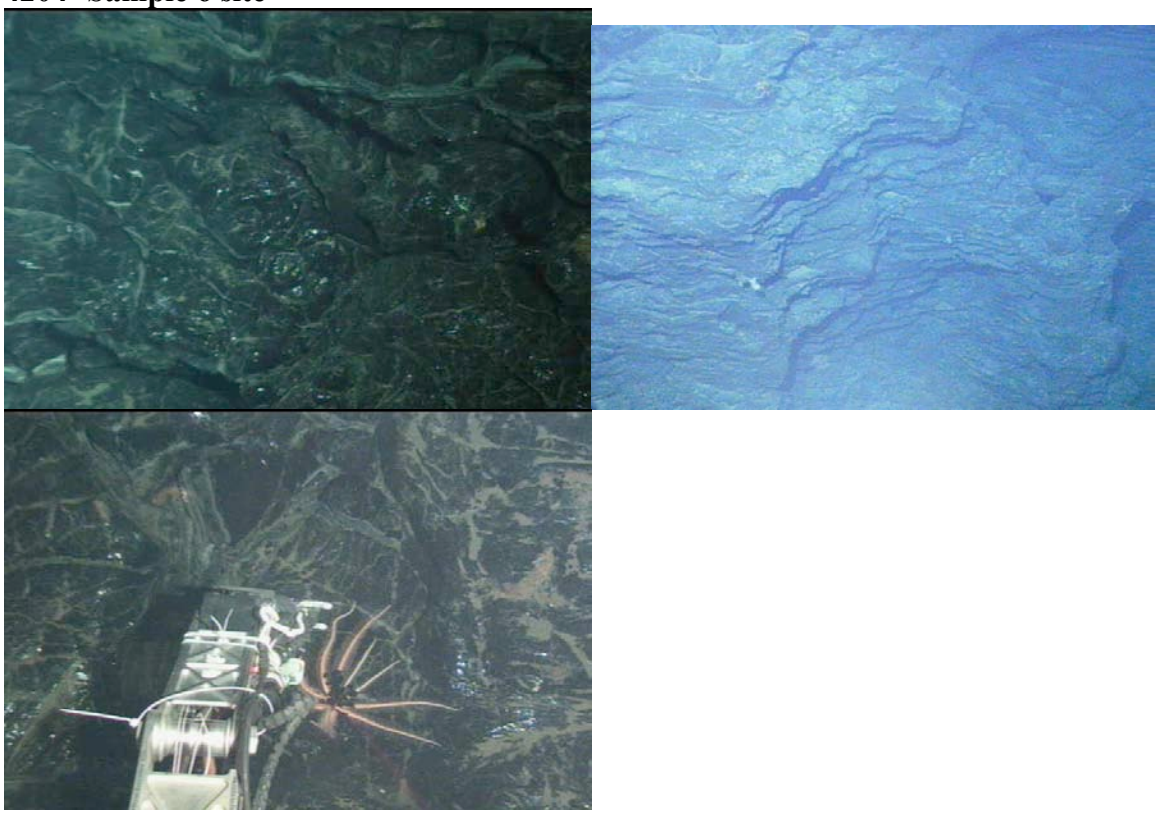
4204- Sample 3 site

4204- Sample 4 site



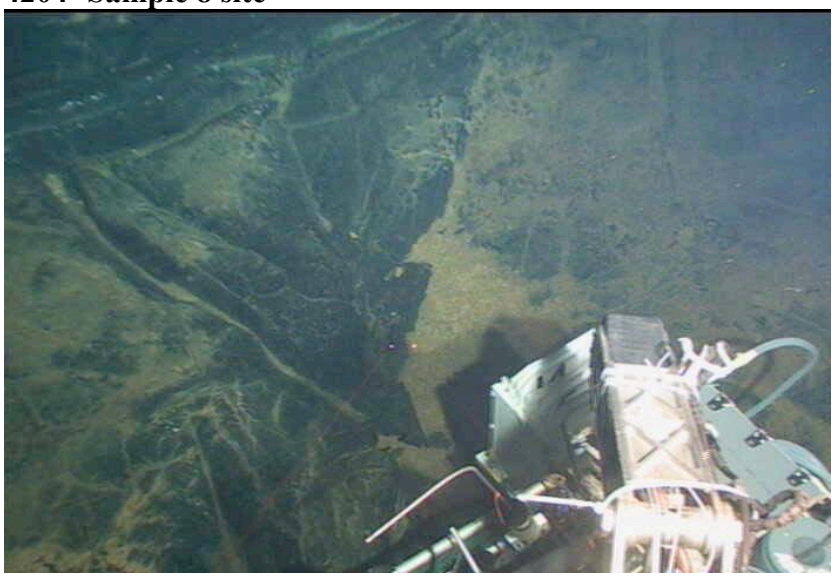
4204- Sample 5 site

4204- Sample 6 site



4204- Sample 7 site

4204- Sample 8 site



4204- Sample 9 site